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Measuring change in gait performance of children with motor disorders: assessing the Functional Mobility Scale and the Gillette Functional Assessment Questionnaire walking scale

Ammann-Reiffer, Corinne ; Bastiaenen, Caroline H G ; Van Hedel, Hubertus J A

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Measuring change in gait performance of children with motor disorders: assessing the Functional Mobility Scale and the Gillette Functional Assessment Questionnaire walking scale

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ABBREVIATIONS

FAQ	Gillette Functional Assessment Questionnaire walking scale
FMS	Functional Mobility Scale
GRS	Global rating scale
MIC	Minimal important change
ROC	Receiver operating characteristic

AIM To examine the responsiveness and minimal important change (MIC) of two gait performance measures, the Functional Mobility Scale (FMS) and the Gillette Functional Assessment Questionnaire walking scale (FAQ), in a paediatric inpatient setting.

METHOD Sixty-four children and adolescents with a motor disorder, including cerebral palsy, traumatic brain injury, or stroke (25 females, 39 males; mean age [SD] 12y 6mo [3y 2mo], range 6–18y 6mo), were recruited. Physiotherapists scored the FMS and FAQ at the start and end of active gait rehabilitation. Change scores were compared with changes in gait capacity tests, the walking item of the Functional Independence Measure for Children, and a global rating scale (GRS) on the physiotherapists' perceived change of the child's functional mobility. The GRS was also used to define the MIC.

RESULTS Change scores of the FMS and FAQ correlated between 0.35 and 0.49 with those of the capacity tests, 0.54 to 0.76 with the Functional Independence Measure for Children walking item change scores, and 0.57 to 0.76 with the GRS. The MIC values for the FMS and FAQ were 0.5 and 1.5 respectively.

INTERPRETATION FMS and FAQ can illustrate change in inpatient gait performance of children and adolescents with motor disorders. An improvement of one level in the FMS and two levels in the FAQ is considered as a clinically meaningful change.

Clinicians and researchers rely on various outcome instruments when they evaluate the effects of interventions that aim at improving walking abilities in children with motor disorders. With regard to the International Classification of Functioning, Disability and Health for Children and Youth, most of these instruments can be linked to the body function domain or the capacity level of the activity domain.^{1,2} Capacity describes what a child can do in a standardized controlled environment.³ Although walking capacity has an impact on walking performance (i.e. how a child actually moves in their environment in daily life), environmental and personal factors seem to play an even more important role and are valuable to integrate in constructs measuring walking ability.⁴ Within this perspective, walking performance is defined as how children actually move around in their current environment in everyday life.³

The Functional Mobility Scale (FMS) and the Gillette Functional Assessment Questionnaire walking scale (FAQ) are examples of the few tools that assess walking ability on a performance level. The FMS describes the level of a child's functional mobility in everyday life over 5m, 50m, and 500m, representing the home, school, and community

settings respectively.⁵ For each distance, an ordinal rating from 1 to 6 is assigned depending on the amount of assistance required for the child's mobility. It is usually administered by a clinician in a semi-structured interview using child-report or parent-report.⁵

The FAQ assesses the level of a child's functional mobility on an ordinal scale by describing various levels of mobility differing in environment, terrains, or obstacles.⁶ The scale ranges from 1 (the child cannot take any steps at all) to 10 (the child walks, runs, and climbs on level and uneven terrain without difficulty).⁶ It is a parent-report or self-report measure to identify the child's usual level of function. Both the FMS and the FAQ are easy to use and require no specific assessor training.⁷

To accurately measure and interpret a child's performance in clinical practice and research, assessments should be sufficiently valid, reliable, and responsive. The CONsensus-based Standards for the selection of health Measurement INstruments group defined responsiveness as 'the ability of an instrument to detect change over time in the construct to be measured'.⁸ Another relevant aspect is the degree to which one can assign qualitative meaning to

scores or change scores: in other words, the interpretability of instruments.⁹ Minimal important change (MIC) is one aspect of interpretability and is defined as ‘the smallest change in score in the construct to be measured which patients perceive as important’.⁸ For this, change scores are related to a clinically meaningful reference (i.e. an anchor-based approach) from a patient’s or clinician’s perspective. It is important that the anchor reflects the construct that the target instrument aims to measure.⁹

The FMS correlated moderately to very strongly ($r_s=0.58-0.89$) with other gait measures in inpatient and outpatient settings.^{5,10} Interrater agreement was substantial to almost perfect in ambulatory children with motor disorders.^{5,11,12} Furthermore, FMS scores obtained by parent interview and direct observation agreed substantially,¹³ and it seems to be responsive in an outpatient setting.^{5,6,11-14}

The FAQ showed almost perfect intrarater and interrater reliability as well as content and concurrent validity compared with other measures of gait function in children with various motor disorders.⁶ It has been used as an outcome measure after various interventions.^{15,16} However, we are unaware of studies focusing on the evaluation of the responsiveness of the FAQ in a psychometric study design in outpatients or inpatients.

Thus, our aim was to investigate responsiveness of the FMS and FAQ in children and adolescents with motor disorders in an inpatient neurorehabilitation setting by examining the correlations between changes over time in FMS and FAQ scores with changes over time in standard functional and capacity measures. We formulated the following four hypotheses *a priori*, as follows. (1) Correlations between the change scores of the FMS and FAQ and the change scores of the comparator tests are positive and moderate to strong, with Spearman’s correlation coefficients (r_s) at least 0.4. (2) Correlations between a global rating scale (GRS) quantifying the therapists’ perceived change of the children’s functional mobility in everyday life and the change scores of the FMS and FAQ are stronger than the correlations between the GRS and the change scores of the capacity measures. (3) The values of the area under the receiver operating characteristic (ROC) curves between the dichotomized GRS (no change versus change [improvement]) and the FMS and FAQ are at least 0.7. This threshold would indicate that the measures could discriminate between children whose walking performance remained unchanged versus those who changed (improved). (4) The change scores of the FMS and FAQ in children who had received surgery are larger than in non-operated children.

Further, we determined the MIC of the FMS and FAQ by relating the change scores of the two measures to the treating physiotherapists’ perceived change of the children’s functional mobility.

METHOD

Study design and setting

This prospective longitudinal psychometric study used a construct and criterion approach to evaluate responsiveness

What this paper adds

- The Functional Mobility Scale (FMS) can detect change in children’s inpatient gait performance.
- The Gillette Functional Assessment Questionnaire walking scale (FAQ) can also detect change in children’s inpatient gait performance.
- A one-level improvement in the FMS is clinically relevant.
- A two-level improvement in the FAQ is clinically relevant.

and an anchor-based approach to assess the MIC of two gait performance measures. Measurements were performed at the Rehabilitation Center Affoltern am Albis of the Children’s University Hospital Zurich, Switzerland. The centre provides inpatient and outpatient treatment for children and adolescents with predominantly congenital and acquired neurological disorders. The most frequent reasons for admission to the centre are postsurgical treatment and improving independence in everyday life activities. The study was approved by the Ethics Committee Zurich and registered on ClinicalTrials.gov (NCT02237222).

Participants

Children and adolescents were eligible for the study if they (1) were between 6 years and 18 years 11 months of age; (2) had an acquired or congenital motor diagnosis, such as stroke, traumatic brain injury, or cerebral palsy; (3) were inpatients at the rehabilitation centre; and (4) their rehabilitation programme contained therapy sessions in which they actively trained their gait function. Therapists reported children who met these inclusion criteria. These children and their parents subsequently received oral and written study information by a research assistant and were consecutively recruited between April 2014 and January 2016, provided that at least one parent understood German well. Signed informed consent and assent by the legal guardian and the child was given. Adhering to the criteria provided by the COnsensus-based Standards for the selection of health Measurement INstruments (COSMIN) guidelines, we aimed for a sample size of at least 50.¹⁷ In total, 64 children and adolescents (25 females, 39 males; mean age [SD] 12y 6mo [3y 2mo], range 6–18y 6mo), were recruited.

Measures

For the FMS, we substituted the home (5m), school (50m), and community (500m) settings¹¹ into mobility within the patient room, within the rehabilitation centre (between ward, therapies, and inpatient school), and outside the rehabilitation centre.

For the FAQ, we considered the children’s functional mobility within the rehabilitation centre (levels 1–5) or outside the rehabilitation centre (levels 6–10).⁶

The 6-Minute Walking Test investigates functional capacity.¹⁸ Limited to moderate evidence exists for its convergent validity with various body function parameters in children with chronic conditions. Its test–retest reliability in children with cerebral palsy is almost perfect,^{2,19,20} while evidence for its responsiveness is limited and only available for children with Duchenne muscular dystrophy.²⁰

The 10-Metre Walking Test evaluates self-selected or maximal gait speed over a short distance.²¹ Relative test-retest reliability of the 10-Metre Walking Test is high in children with neurological gait disorders.^{2,19}

The Gross Motor Function Measure-88 is a standardized tool for measuring gross motor function in children with motor disabilities.²² The 24 ordinal-scale items of the dimension E assess walking, running, and jumping abilities. The psychometric properties of the total Gross Motor Function Measure-88 are well explored, especially in children with cerebral palsy.²³ Evidence for the psychometric properties of the single dimensions is mostly unknown. Timed walking tests and the Gross Motor Function Measure Dimension E were mainly performed in children for whom these tests were clinically indicated as part of their inpatient rehabilitation programme.

The Functional Independence Measure for Children assesses a child's level of independence during various activities of daily living on the performance level (Uniform Data System for Medical Rehabilitation, Buffalo, NY, USA). The items are scored on a 7-point ordinal scale. Intraclass correlation coefficients of the locomotion subscale are 0.94 to 0.97 for intrarater and 0.73 to 0.85 for interrater reliability, and correlations with mobility domains of other functional measures are strong.^{24,25} We used only the walking item of the locomotion subscale.

A 5-point GRS (much worse, somewhat worse, unchanged, somewhat better, much better), specifically designed for this study, was used as an anchor, quantifying the physiotherapists' perceived change of the children's functional mobility by asking, 'compared to the beginning of active gait rehabilitation, how has the child's functional mobility in everyday life changed in your opinion?'

Study procedure

We used the German versions of both questionnaires, which had been approved by the authors of the original English versions. Details about the translation procedure and results on their reliability and validity are reported elsewhere.^{10,12}

Data on patients' age, sex, diagnosis, and length of rehabilitation stay were collected from their electronic medical records. Measurements took place at two time points: T_0 at the start and T_1 at the end of the active gait rehabilitation programme. This period usually varies from 4 weeks to 6 months.

The physiotherapist who was mainly responsible for the therapy of the child completed the FMS and the FAQ at T_0 and T_1 , and the GRS at T_1 . As the therapists had no previous experience with the FMS or FAQ, they received brief protocolled instructions beforehand. To ensure that the therapists filled in the forms accurately and adhered to the standardized instructions, an independent research fellow (CA-R) performed a standardized interview. Both instructions and interview were based on the directives found on the questionnaires. To reduce risk of bias, physiotherapists and the research fellow were unaware of the

other test results and did not have access to T_0 ratings when scoring FMS, FAQ, and GRS at T_1 . Details about the implementation of the other tests are outlined in Table SI (online supporting information).

Statistical analysis

Descriptive statistics are presented for relevant characteristics of the study population and outcome measures. We summarize continuously distributed data by the median (25th–75th centiles). SPSS version 24.0 (IBM SPSS Statistics, Armonk, NY, USA) was used for statistical analyses. We treated each FMS distance as a separate measure.

For hypotheses 1 and 2, we calculated Spearman's correlation coefficients and 95% confidence intervals employing bootstrapping, i.e. random sampling with replacement (bias corrected and accelerated method with 1000 samples), to quantify the relationship between the change scores of the FMS and FAQ, the comparator measures, and the GRS.²⁶ We were interested in changes of the construct 'walking capacity' rather than in changes of each single capacity measure. Therefore, we averaged these correlations by transforming each of them into Fisher's z-scores, summarized and averaged these scores, and finally transferred the averaged z-scores back into a correlation coefficient.¹⁰ We interpreted values from 0 to 0.19 as very weak, 0.2 to 0.39 as weak, 0.4 to 0.59 as moderate, 0.6 to 0.79 as strong, and 0.8 and higher as very strong.²⁷

To test hypothesis 3, we performed non-parametric ROC curve analyses between the dichotomized GRS and the FMS and FAQ.²⁸ We considered a value of the area under the ROC curves of at least 0.7 as appropriate to demonstrate the ability of the FMS and FAQ to discriminate between children who had improved and those who had not improved according to the therapists' ratings on the GRS.²⁹ For hypothesis 4, we used a Mann–Whitney U test to quantify the differences between the two groups and set the statistical level of significance for a two-tailed test at $\alpha=0.05$.

We calculated the Youden index (sensitivity + specificity – 1) for all points of the ROC curve and selected the maximum value of this index as the optimal cut-off point for the MIC of the tools.²⁹ Missing data were not replaced.

RESULTS

The active gait rehabilitation period of the 64 participants (6–18y 6mo) lasted on average 46 days (SD 41.9d) and varied between 14 days and 295 days. Further characteristics of the study population and information on the measurements are presented in Table I.

The functional abilities of the participants differed widely and ranged over the whole spectrum of the FMS and FAQ (Fig. 1). Thus, not all children were able to perform all capacity tests and/or at both time points (Table I).

Change scores varied largely from –2 to 5 for the FMS and from –1 to 7 for the FAQ (Fig. 1).

Correlations between the change scores of the FMS and FAQ and the change scores of the comparator tests were all positive. The values of r_s for the comparisons with

Table 1: Characteristics of the study population (*n*=64)

Median age (IQR) (y:mo)	12:10 (4:11)
Sex (<i>n</i>)	
Female	25
Male	39
Diagnoses (<i>n</i>)	
Cerebral palsy	35
GMFCS level I	7
GMFCS level II	10
GMFCS level III	12
GMFCS level IV	6
TBI	8
Genetic disorders	5
Stroke	5
Encephalitis	3
Other	8
Surgery before rehabilitation (<i>n</i>)	
No	43
Median age (IQR) (y:mo)	12:10 (5:4)
Yes	21
Median age (IQR) (y:mo)	13:5 (4:7)
Missing data ^a	
FMS 5m	—
FMS 50m	2
FMS 500m	4
FAQ	—
Score distribution of comparator tests; median (IQR)	
10MWTss (m/s)	
<i>T</i> ₀ :	0.59 (0.67)
<i>T</i> ₁ :	0.76 (0.59)
10MWTm (m/s)	
<i>T</i> ₀ :	0.91 (0.76)
<i>T</i> ₁ :	1.1 (0.9)
6MinWT (m)	
<i>T</i> ₀ :	221 (271)
<i>T</i> ₁ :	307 (259)
GMFME (%)	
<i>T</i> ₀ :	47 (65)
<i>T</i> ₁ :	56 (75)
WeeFIM walking	
<i>T</i> ₀ :	5 (4)
<i>T</i> ₁ :	6 (1)
Time range of measurements (d)	
<i>T</i> ₀ : median (IQR)	3 (4)
<i>T</i> ₁ : median (IQR)	2 (3)

^aMissing data can be attributed to children who did not cover these distances in any form at the time of data collection. IQR, interquartile range; GMFCS, Gross Motor Function Classification System; TBI, traumatic brain injury; FMS, Functional Mobility Scale; FAQ, Gillette Functional Assessment Questionnaire walking scale; 10MWTss/m, 10-Metre Walking Test self-selected/maximal speed; *T*₀, start of active gait rehabilitation; *T*₁, end of active gait rehabilitation; 6MinWT, 6-Minute Walking Test; GMFME, Gross Motor Function Measure Dimension E; WeeFIM walking, Functional Independence Measure for Children walking item.

change scores of the averaged capacity tests were 0.39, 0.49, and 0.40 for the FMS 5m, 50m, and 500m respectively and 0.35 for the FAQ, while those with the Functional Independence Measure for Children walking item change scores ranged from 0.54 to 0.76 (Table IIa).

Correlations between the GRS and the change scores of the FMS and FAQ were moderate to strong and ranged from 0.57 to 0.76, while the GRS correlated weakly with the change scores of the averaged capacity tests ($r_s=0.36$; Table IIb).

The ROC curve analyses between the dichotomized GRS (unchanged versus somewhat better/much better) and

the FMS and FAQ change scores revealed values for the area under the ROC curves above the a priori defined threshold of 0.7 (FMS 5m, 50m, 500m, and FAQ: 0.79, 0.75, 0.76, and 0.80 respectively; see Fig. S1, online supporting information). No child was rated as somewhat worse/much worse on the GRS, although six children partly deteriorated in FMS or FAQ scores.

The median change scores in the non-operated children were 0 for the FMS and 1 for the FAQ. In the postsurgical children, the median change scores were 3, 3, and 2 for the FMS 5m, 50m, and 500m respectively and 3 for the FAQ (Fig. 2). The differences were statistically significant for all change scores between the two groups (FMS 5m, 50m, 500m, and FAQ: $z=-3.55$, $z=-3.78$, $z=-2.82$, and $z=-3.01$ respectively; see Fig. 2).

The maximum value of the Youden index resulted in an optimal cut-off point of 0.5 for each distance of the FMS and 1.5 for the FAQ. Thus, in practice, children have to improve at least one level on the FMS 5m, 50m, and 500m and two levels on the FAQ to achieve the MIC.

DISCUSSION

We investigated the responsiveness of the FMS and FAQ on a construct-based (correlations) and a criterion-based (ROC curves) method with preset hypotheses in children and adolescents with motor disorders in an inpatient neurorehabilitation setting. Further, we calculated the MIC using an anchor-based approach for the two measures.

Our results for the correlation strengths with the averaged capacity change scores only partly confirmed hypothesis 1, as only the FMS 50m and 500m reached the expected level of 0.4, whereas the correlations were lower for the FMS 5m and FAQ. These results were not in line with previous research in outpatients, which showed strong (positive) correlations between changes in FMS scores and changes in outcomes of other measures of functional activity assessed with questionnaires ($r_s=0.75-0.83$) and activity monitors ($r_s=0.78-0.89$).⁵

The stronger correlations of the FMS and FAQ with the change score of the Functional Independence Measure for Children walking item in our study may reflect that these measures all rate change in performance in everyday situations within the rehabilitation setting, while the capacity measures required the children to perform changes on their maximal level within a standardized test situation.

As information on the responsiveness of the clinically often-used gait comparator measures is largely missing, we designed a GRS to estimate therapists' perceived change of the children's functional mobility in parallel. Because the reliability of this GRS is unknown, we used it within a construct and criterion approach.⁹ Correlations between the GRS and the change scores of the FMS and FAQ were all moderate to strong, showing that the FMS and FAQ could adequately reflect the therapists' judgements about the children's functional change in everyday life mobility during inpatient rehabilitation. As the correlation between the GRS and the change score of the averaged capacity

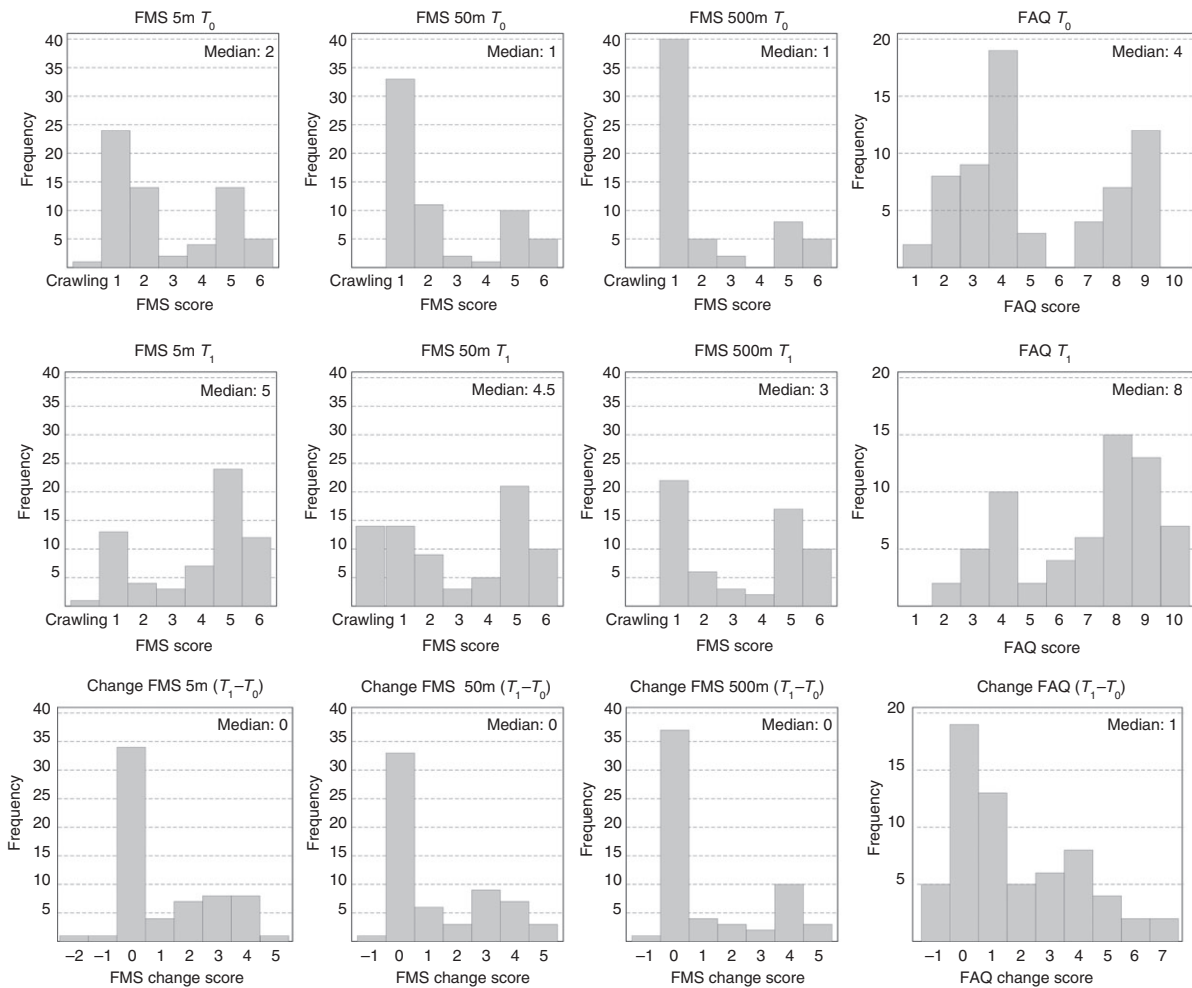


Figure 1: Frequency distributions of the Functional Mobility Scale (FMS) 5m, 50m, and 500m and the Gillette Functional Assessment Questionnaire walking scale (FAQ). T_0 , start of active gait rehabilitation; T_1 , end of active gait rehabilitation.

tests was only weak, hypothesis 2 was confirmed. We could also confirm hypothesis 3, in which we used the GRS as the external criterion of the children's change in functional mobility. The values of the area under the ROC curves ranged between 0.75 and 0.80 and showed that both FMS and FAQ could be used to discriminate between children whose walking performance remained unchanged and those who improved.

We additionally compared the mean changes of the FMS and FAQ in subgroups of children who had undergone orthopaedic surgery and the other children, because the first group was expected to improve more than the other one. The first rating took place when children just started active gait rehabilitation and were allowed to start loading their legs after orthopaedic surgery. Because of this low initial level of walking ability, we expected the postsurgical children to improve more distinctly than the others. Despite the fact that the non-surgical group also comprised children with acute acquired injuries whom we expected to undergo large improvements due to spontaneous neurological recovery in combination with the rehabilitation

programme, we could confirm hypothesis 4. Also, a previous study on the FMS in the outpatient setting demonstrated longitudinal changes in the outcomes of the scale in children who had received orthopaedic multilevel surgery.⁵

It is important to notice that the potential of improvement largely depends on a child's basic motor abilities. Using Rasch analysis, Stout et al. provided a common scale for different classification systems and outcome measures of physical functioning. With that, they illustrated the probability of successfully performing tasks of different difficulty levels depending on an individual's present motor abilities.³⁰ Consequently, a child with a score of 1 for the FMS 5m, 50m, and 500m at T_0 will have more space for improvement than a child entering rehabilitation with a score of 6. In our study, 38% of the children had a score of 1 over all three distances of the FMS (which decreased to 20% at the second measurement time point). Although this could be interpreted as a floor effect, it is not of interest so long as the measure is used to evaluate functional mobility for a child's walking ability.⁹ A ceiling effect was not an issue, as only 8% of the children had an initial

Table II: Spearman's correlations (95% confidence intervals) between (a) the change scores of the Functional Mobility Scale (FMS), the Gillette Functional Assessment Questionnaire walking scale (FAQ), and other gait measures and (b) the global rating scale (GRS) of the therapists' perceived change and the change scores of gait measures

(a) Correlations between change scores of the FMS and FAQ and those of the comparator tests

	Δ Capacity tests	Δ 10MWTss	Δ 10MWTm	Δ 6MinWT	Δ GMFM E	Δ WeeFIM walking
Δ FMS 5m	0.39 (−0.06 to 0.72)	0.20 (−0.45 to 0.72)	0.47 (0.14 to 0.73)	0.50 (0.18 to 0.75)	0.37 (−0.08 to 0.68)	0.54 (0.28 to 0.74)
<i>n</i>	23	23	19	20	23	53
Δ FMS 50m	0.49 (0.06 to 0.77)	0.38 (−0.02 to 0.68)	0.70 (0.43 to 0.85)	0.36 (−0.14 to 0.71)	0.45 (−0.16 to 0.79)	0.73 (0.58 to 0.85)
<i>n</i>	23	23	19	20	23	52
Δ FMS 500m	0.40 (−0.15 to 0.77)	0.40 (−0.08 to 0.73)	0.35 (−0.37 to 0.77)	0.41 (0.00 to 0.75)	0.45 (−0.13 to 0.80)	0.61 (0.39 to 0.79)
<i>n</i>	22	22	19	20	23	50
Δ FAQ	0.35 (−0.10 to 0.70)	0.19 (−0.34 to 0.64)	0.42 (−0.09 to 0.75)	0.44 (0.08 to 0.72)	0.36 (−0.06 to 0.68)	0.76 (0.62 to 0.84)
<i>n</i>	23	23	19	20	23	53

(b) Correlations between the GRS and change scores of the gait measures

Performance measures	Δ FMS 5m	Δ FMS 50m	Δ FMS 500m	Δ FAQ	Δ WeeFIM Walking
<i>n</i>	63	59	59	63	52
Capacity measures	Δ Capacity tests	Δ 10MWTss	Δ 10MWTm	Δ 6MinWT	Δ GMFM E
<i>n</i>	23	23	19	20	23

Δ , change score; 10MWTss/m, 10-Metre Walking Test self-selected/maximal speed; 6MinWT, 6-Minute Walking Test; GMFM E, Gross Motor Function Measure Dimension E; WeeFIM walking, Functional Independence Measure for Children walking item.

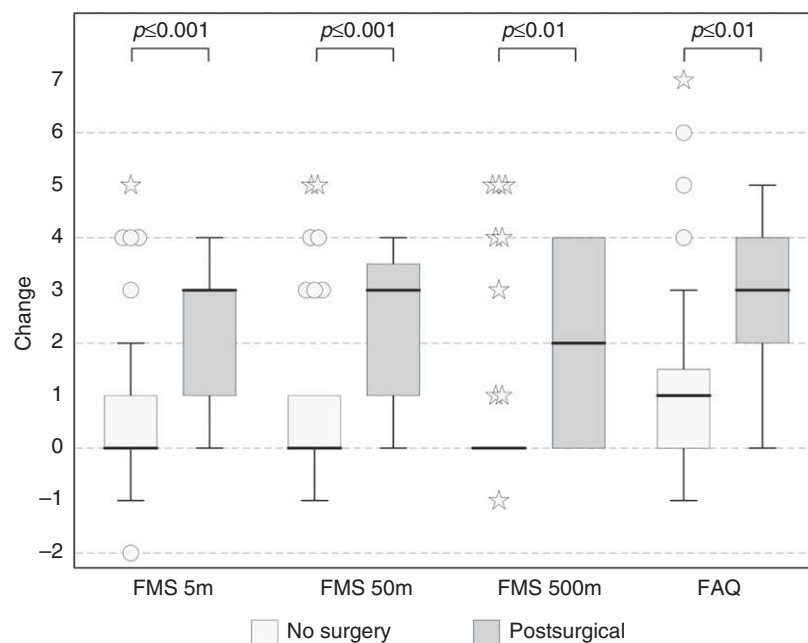


Figure 2: Comparison of change scores between children who had received surgery or not before undergoing rehabilitation. FMS, Functional Mobility Scale; FAQ, Gillette Functional Assessment Questionnaire walking scale; horizontal line, median; box, interquartile range; whiskers, $\pm 1.5 \times$ interquartile range; small circle, mild outlier (more than $1.5 \times$ interquartile range); star, extreme outlier (more than $3 \times$ interquartile range).

score of 6 (compared with 17% at the end). For possible floor and ceiling effects of the FAQ, only 3% and 0% of the children had initially the lowest and highest possible scores respectively.

So far, responsiveness has only been evaluated for the FMS.^{5,14} The correlations in our study were lower than previously reported. A reason may be that the other studies

took place in the outpatient setting, exclusively looked at children after surgery, and used other comparator instruments. However, we were not able to test this assumption because in our study the sample sizes of specific subgroups were too small to calculate reliable correlations.

The MIC values indicate a 1-point (FMS) and 2-point (FAQ) increase to be clinically meaningful. These values

seem logical from a contextual point, as each level of the FMS signifies the (in)dependence on/from another type of walking device, while the FAQ levels vary unevenly in terms of distance, environment, mobility, and independence. However, as both measures are ordinal-scaled, the MIC may be different for children on the lower and higher ends of the scales. Our reported MIC of 2 for the FAQ is consistent with the overlapping item difficulty levels for the FAQ levels 5 and below and level 6 derived by Rasch analysis.³⁰ Considering the results of the Rasch analysis, an MIC of 1 might be more likely for children classified in FAQ level 7 and higher at T_0 . To address these potential differences over the whole range of the scales, thus enabling an estimation of the MIC for individual patients, larger samples of patients would be necessary to allow a differentiation between various motor ability subgroups.

Methodological considerations

The FMS distances represent children's usual surroundings (home, school, and community), which we had to substitute for the inpatient setting. However, previous research on the interrater reliability between health professionals, who measured inpatient everyday life mobility, and parents, who rated their child's mobility in the usual environments, provides evidence that our adaptations made for the inpatient setting seem to correspond well to the home setting.¹² In line with the recommendations of de Vet et al.,⁹ we used an anchor-based approach to assess the MIC, as this includes a definition of what is considered minimally important. Of course, the rating of the parents or even children could be considered most relevant in the context of MIC. However, because of the inpatient setting (parents are not present throughout the day; for most children it would be difficult to remember the initial situation), the GRS was rated by the therapists. For the same reasons, the therapists scored the FMS and FAQ, in contrast to the measures' original test administration, which involved child-report or parent-report. The fact that the GRS was rated by the treating therapist could have resulted in a slight overestimation of the perceived change. Although we had to dichotomize the GRS ratings for the ROC analysis at an arbitrarily chosen cut-off point, analyses showed that the MICs would not change with another selected cut-off level. Unfortunately, we could not compare the MIC with the smallest detectable change, as the latter is still unknown for both measures.

Although we exceeded the targeted sample size of 50, the samples were smaller for the analyses with the capacity tests and the subgroups for surgical/non-surgical intervention. Because we aimed for a representative sample of our inpatient rehabilitation setting, this meant that not every included patient was able to perform every test at both time points. This fact could have biased the reported correlations for hypotheses 1 and 2. However, as the groups with and without capacity test data did not differ systematically, the correlations can be applied to the entire patient sample. The duration between the two rating time points varied considerably, which is an inevitable characteristic in neurorehabilitation. At the same time, the heterogeneity of our sample in terms of age, diagnoses, mobility levels, and rehabilitation duration facilitates the transfer of our results to other inpatient settings.

CONCLUSION

We evaluated the responsiveness of the FMS and FAQ within a paediatric inpatient setting. We have shown that both tools are suitable for depicting the change that has occurred in children's gait performance. Moreover, the results facilitate the interpretation of FMS and FAQ scores in clinical practice and research by defining an MIC for both tools.

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SUPPORTING INFORMATION

The following additional material may be found online:

Table S1: Details of the test procedures for the comparator instruments

Figure S1: Receiver operating characteristic curve analysis between the dichotomized global rating scale and the Functional Mobility Scale and the Gillette Functional Assessment Questionnaire walking scale.

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RESUMEN

MEDICIÓN DEL CAMBIO EN EL DESEMPEÑO DE LA MARCHA EN NIÑOS CON TRASTORNOS MOTORES: EVALUACIÓN DE LA ESCALA DE MOVILIDAD FUNCIONAL Y EL CUESTIONARIO DE EVALUACIÓN FUNCIONAL DE GILLETTE

OBJETIVO Examinar la sensibilidad y el cambio mínimo significativo de dos mediciones de desempeño de la marcha, la Escala de Movilidad Funcional (FMS) y el Cuestionario de Evaluación Funcional de Gillette (FAQ), en una población de pacientes pediátricos hospitalizados.

MÉTODO Se reclutaron sesenta y cuatro niños y adolescentes con algún trastorno motor, incluyendo parálisis cerebral, lesión cerebral traumática o accidente cerebrovascular (25 mujeres, 39 varones; edad promedio [DE] 12a 6m [3a 2m], rango 6a – 18a 6m). Fisioterapeutas aplicaron las escalas FMS y FAQ al principio y final del proceso de rehabilitación activa de la marcha. Los puntajes de cambio fueron comparados con los cambios en pruebas de capacidad de marcha, el ítem de marcha de la escala WeeFIM (Functional Independence Measure for Children) y una escala global de calificación (EGC) sobre la percepción del fisioterapeuta del cambio en la movilidad funcional del niño. La EGC se utilizó, además, para definir el cambio mínimo significativo.

RESULTADOS Los puntajes de cambio de la FMS y el FAQ tuvieron una correlación de 0,35 a 0,49 con lo de la prueba de capacidad de marcha, 0,54 a 0,76 con el ítem de marcha de la escala WeeFIM, y 0,57 a 0,76 con la EGC. El cambio mínimo significativo para la FMS y el FAQ fueron 0,5 y 1,5, respectivamente.

INTERPRETACIÓN La FMS y el FAQ permiten observar cambios en el desempeño de la marcha de pacientes pediátricos y adolescentes hospitalizados con trastornos motores. Un cambio positivo de un nivel en la FMS y de dos niveles en el FAQ se considera un cambio clínicamente significativo.

RESUMO

MENSURANDO MUDANÇA NO DESEMPENHO DA MARCHA EM CRIANÇAS COM DESORDENS MOTORAS: AVALIANDO A ESCALA DE MOBILIDADE FUNCIONAL A ESCALA DA MARCHA DO QUESTIONÁRIO DE AVALIAÇÃO FUNCIONAL GILLETTE

OBJETIVO Examinar a responsividade e mínima mudança importante (MMI) de duas medidas do desempenho da marcha, a Escala de mobilidade funcional (FMS), e a escala da marcha do Questionário de Avaliação Funcional Gillette (FAQ), em uma unidade de internação pediátrica.

MÉTODO Sessenta e quatro crianças e adolescentes com uma desordem motora, incluindo paralisia cerebral, lesão cerebral traumática, ou acidente vascular encefálico (25 do sexo feminino, 39 do sexo masculino; média de idade [DP] 12a 6m [3a 2m], variação 6a–18a 6m), foram recrutadas. Fisioterapeutas pontuaram a FMS e FAQ no início e final da reabilitação ativa da marcha. Mudanças nos escores foram comparadas com mudanças nos testes de capacidade da marcha, no item de marcha da Medida de Independência Funcional para crianças, e uma Escala Global de Pontuação (EGP) sobre as mudanças percebidas pelos fisioterapeutas na mobilidade funcional da criança. A EGP também foi usada para determinar a MMI.

RESULTADOS Os escores de mudança da FMS e FAQ correlacionaram entre 0,35 e 0,49 com os dos testes de capacidade, 0,54 a 0,76 com a mudança de escores no item de marcha da medida de Independência Funcional para crianças, e 0,57 a 0,76 com a EGP. A MMI para FMS e FAQ foi 0,5 e 1,5, respectivamente.

INTERPRETAÇÃO FMS e FAQ podem ilustrar mudanças no desempenho da marcha em crianças e adolescentes com desordens motoras que se encontram internados. Uma melhora de um nível na FMS e dois níveis na FAQ é considerada mudança clinicamente significativa.